

# ESAVE

Environmental Stewardship &  
Value Engineering

Quarterly Newsletter for the United States Department of Energy,  
National Nuclear Security Administration



## Closure of last operating unit latest milestone at Chornobyl

Fifteen years ago, the world grew anxious as media reports described a serious accident at the Chornobyl Nuclear Power Plant in Ukraine. The explosion at Unit 4 on April 26, 1986, turned out to be the worst accident in the history of nuclear power. Thirty lives were lost and many people were exposed to radiation. Radioactive dust, gases and debris were propelled into the air, contaminating portions of Ukraine, Belarus and Russia.



Post-accident view of Chornobyl Nuclear Power Plant's Unit 4 reactor. Inset: The completed concrete shelter over the damaged reactor. Photo credits: The Kurchatov Institute (Russia) and the ISTC-Shelter (Ukraine), November 1986.

Soviet workers rushed to build a large shelter structure over the damaged reactor to slow the release of radioactivity.

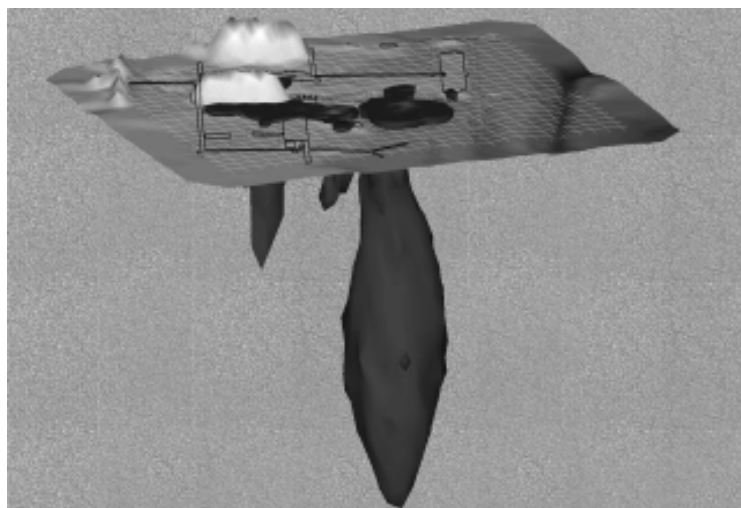
In the years following the accident, Chornobyl Unit 3—adjacent to the damaged Unit 4—continued to operate and supply valued energy and jobs. But on December 15, 2000, following a decree by Ukraine President Kuchma, the site's last operating reactor was shut down.

"The decision to permanently close Unit 3 was a major milestone for Ukraine, the United States, and other countries that See 'Closure of last operating unit' page 2

## Pantex eliminates HE soil removal with N<sub>2</sub> gas injection

In situ remediation relying on naturally occurring microorganisms at the Department of Energy (DOE) Pantex Plant could mean that nearly 70,000 cubic meters of high explosive (HE)-contaminated soil will not have to be excavated and disposed of as hazardous waste.

Pantex Plant's solid waste management unit (SWMU) 122b is a 3-acre area contaminated with the high explosive RDX and some TNT and HMX from the past disposal of explosives machining waste. The contamination is most concentrated in the 30 feet just below the soil surface, but continues downward in places to 265 feet. HE contamination from SWMU 122b has been found offsite and has the potential to leach into the Ogallala aquifer, the region's primary source of drinking water.



High explosive-contaminated soil at a Pantex Plant site is being cleaned up by anaerobic bacteria stimulated by the injection of nitrogen gas into their environment. This computer image shows the extent of the contamination in the unsaturated (vadose) zone beneath the soil surface.

Unless the HE contamination is removed or destroyed, the current remedy of "pump-and-treat" for the groundwater beneath the unsaturated (vadose) zone of contaminated soil will continue indefinitely. Excavation of the soil would be extremely difficult due to the presence of numerous utility lines critical to Pantex Plant's weapons dismantlement process.

Since 1998, contamination in a test portion of SWMU 122b has been biodegraded through a small-scale project sponsored by the DOE Innovative Treatment Remediation Design Program. The test See 'Pantex eliminates HE soil' page 3

# Shared technologies garner pollution prevention benefits at SRS

The Savannah River Site (SRS) is a leader in the deployment of innovative technologies that cost-effectively reduce waste. Recognizing that new technologies are required to continue to reduce pollution, the SRS Pollution Prevention (P2) Team looked in-house for answers, and the SRS Technology Development (TD) group, supporting the Department of Energy's (DOE) Office of Science and Technology (OST), provided solutions.

Some of the technologies deployed at SRS to reduce waste include polyurea specialty coating systems for radiological area recovery strippable coatings for contamination removal, radiological assay equipment such as the Canberra In Situ Object Counting System (ISOCs) for waste characterization and segregation, aerosol capture coatings, size reduction equipment such as the oxy-gas cutting torch, radiological containments such as glove bags and the SuperSleeve™ (see *ESAVE*, Third Quarter 2000), and numerous environmental restoration and in-tank technologies.

Based on these successes and the close working relationship between the SRS TD and P2 Groups, SRS was picked as a pilot by the DOE Headquarters Office of Environmental Management to demonstrate benefits of integrating the P2 and TD programs. The P2/TD pilot, working with Oak Ridge Operations and the Ohio Field Office, renewed focus on the two programs' similarities and on the benefits of leveraging resources by integrating the programs.



*Greg Rudy, SRS Site Manager, and Steve Mackmull, SRS P2 Program Lead, are briefed on the use of Bartlett Services SuperSleeve™ containment equipment at the SRS 2001 Earth Day celebration.*

Recognizing that each program has some unique objectives and performance metrics, SRS learned that improved communications, shared meetings, and leveraging funding resources supports both programs. The P2 Program needs the technology solutions offered and the TD Program needs deployments to prove program viability. Both programs also rely on strong end-user involvement in order to be successful, and lessons learned could be applied from both programs.

SRS also learned that recognizing the maturity of technologies for deployment is not always easy. The Site was unable to deploy technologies in the areas of dissolvable radiological materials and sintered metal HEPA filters (filter material that has been heat-fused with small metal particles) and has cancelled these planned deployments for the near term, but is

continuing to pursue research and development activities.

Pushing new technologies to the field has risks, but as long as the impacts of failure are minimized, overall benefits of investing in new technologies have proven cost-effective. SRS is pushing for the OST Focus Areas to integrate P2 into their technology selection criteria and integrated priority lists to further support the implementation of technologies as P2 solutions.

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## from 'Closure of last operating unit' page 1

supported closure and now are committed to helping Ukraine move beyond Chernobyl," says Dr. James Turner, assistant deputy administrator for the U.S. Department of Energy's Office of International Nuclear Safety and Cooperation.

The United States has been involved at Chernobyl for nearly a decade, helping Ukrainians address a host of safety and environmental issues. The work has been coordinated through the Department of Energy's cooperative program for improving the safety of Soviet-designed reactors.

From an environmental perspective, much of the U.S. effort has focused on helping Ukraine maintain safe operations at Unit 3 until closure could be achieved, and protecting the health and safety of Chernobyl personnel who must periodically enter the Unit 4 shelter and conduct work. Among the projects:

- U.S. and Ukrainian experts developed plans that minimized worker exposure to radiation as repairs were made to a contaminated and unstable 210-foot ventilation stack between Units 3 and 4.
- Equipment and training were provided to improve safety of employees who must enter the shelter. The focus included radiation protection and dose reduction, monitoring of potential uncontrolled fission reactions in the shelter, suppression of dust inside and outside the structure, and providing basic industrial safety equipment.

With the shutdown of Unit 3, the emphasis at Chernobyl has

shifted to assisting Ukraine with deactivation and decommissioning of Unit 3 and two other reactors—Unit 1, shut down in 1996 and Unit 2, closed in 1991—and replacing or covering the deteriorating shelter over Unit 4. The U.S. also is helping Ukraine complete a partially constructed heating plant that will provide hot water and steam for Chernobyl decommissioning activities.

For the longer term, Ukraine is working jointly with the United States, France, Germany and Great Britain to build upon progress at the International Chernobyl Center for Nuclear Safety, Radioactive Waste and Radioecology, established in 1996. The multi-purpose center is studying the environmental, ecological and health issues in the areas affected by the accident, seeking to mitigate socioeconomic impacts associated with the closure of Chernobyl, and developing sustainable operational safety programs for other nuclear power plants in Ukraine. The center also is helping to develop and maintain in-country expertise in the nuclear sciences and address decontamination and decommissioning, spent fuel, and waste management issues at Chernobyl and elsewhere in Ukraine.

The United States and other international supporters remain committed to helping Ukraine address long-standing Chernobyl issues that continue to impact the safety and well-being of people around the world.

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## LANL barrier leads to P2 success

Plastic used in radioactive control areas is one of the largest contributors of low-level waste (LLW) at Los Alamos National Laboratory (LANL).

As a way of reducing the volume of LLW, LANL's Solid Waste Operations (SWO) is using washable contamination barriers instead of disposable plastic barriers. Julia Minton-Hughes and Tim Martinez of SWO thought of using the washable floor barriers in Technical Area 54 and received a 2001 Pollution Prevention Award from LANL for their efforts toward pollution prevention and waste minimization.

To prevent the spread of radioactive contamination, the new washable tarps can either be placed on the floor or used to build containment structures. The floor barriers are made from a tough fabric called ImpervaGuard™ nylon. They are waterproof, rip-proof and stay in place on the floor. "They are durable enough that we can have trucks and forklifts drive over them without damaging them," Martinez said.

The original plastic tarps stretched, moved and became very slippery when wet, according to Martinez. Because of wear and tear, they were replaced about once a month. The new washable tarps can stay in place more than six months before they are washed and reused. Use of these contamination barriers could save LANL more than \$90,000 per year in reduced LLW generation.

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*A washable floor barrier in Technical Area 54 at Los Alamos National Laboratory has reduced low-level radioactive waste.*

### from 'Pantex eliminates HE soil' page 1

project involves injecting nitrogen gas into the contaminated soil to create an anaerobic (oxygen-free) environment, which stimulates naturally occurring anaerobic microorganisms that destroy the HE contaminants.

Pantex Plant plans to expand the area of SMWU 122b under treatment vertically and laterally to encompass the contaminated vadose zone. Additional nitrogen-injection wells will be installed and microbe activity monitored.

Treating the HE contaminants in situ will reduce the potential for contamination of the Ogallala Aquifer, reduce risks to cleanup workers, and significantly reduce the costs of SMWU 122b cleanup while accelerating the cleanup schedule. Pantex Plant estimates show that an investment of \$550,000 in the nitrogen-injection treatment now will avoid \$18 million in site cleanup costs during the project's 10-year life cycle.

Not removing the contaminated soil also avoids the generation of approximately 69,000 cubic meters of hazardous waste. The nitrogen-injection technology is applicable to HE remediation efforts at other DOE and Federal installations.

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## EPA names Livermore Lab a 'champion of green government'

The U.S. Environmental Protection Agency (EPA) has recognized Lawrence Livermore National Laboratory (LLNL) as a "champion of green government." Recycling materials from decontamination and demolition projects has earned the Laboratory a Greening the Government Award from EPA—recognition and appreciation of individuals and groups that go "above and beyond the call of duty in working to improve the environment."

At the heart of the effort is LLNL's Space Action Team (SAT), created six years ago in the Chemistry and Materials Science Directorate to improve efficiency and reduce costs by helping to consolidate facilities and programs across the lab. The 32-member SAT, headed by Program Leader Mitch Waterman, is responsible for LLNL's decontamination and demolition projects. "SAT has always believed that economic decontamination and demolition is real and that pollution prevention is clearly a cost-saving process," said Waterman. "Safety has also been a top priority. In our six years of operation, we have not had a lost work-day or injury."

The award citation from EPA reads: "The Space Action Team at LLNL has recycled approximately 90 percent of materials from decontamination and demolition projects at the lab. Soil, asphalt, concrete, wood, steel and electromechanical infrastructure and equipment have been recycled during the demolition of 11 buildings and 22 trailers. Soil, asphalt and concrete are now being used at landfill sites for construction, road improvements and daily operational needs. LLNL has reduced landfill costs for those materials to zero. Pollution prevention is a guiding principle in all decontamination and demolition projects."

Kent Wilson, LLNL Pollution Prevention coordinator, said the approach SAT has developed demonstrates that "pollution prevention not only improves the environment and protects natural resources, but it also makes good business sense in decontamination and demolition."

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## Greenhouse emissions made useful

Initial research and testing at the U.S. Department of Energy's (DOE) National Energy Technology Laboratory (NETL) in Morgantown, W. Va., to convert emissions that aggravate the greenhouse effect into a useful product have produced encouraging preliminary results.

Investigators are looking at a catalytic process that converts natural gas and carbon dioxide, potential greenhouse gases, into "synthesis gas," a mixture of hydrogen and carbon monoxide that can be used to produce fuels or chemicals. Diesel fuel made from synthesis gas produces less pollution than conventional diesel fuel.

This process can also be used for recovering energy losses in combustion/gasification systems or advanced gas turbines, leading to an increase in overall efficiency. The challenge for NETL researchers is to develop catalysts that operate at high pressure and temperature without forming excess carbon.

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# U.S. DEPARTMENT OF ENERGY DEFENSE PROGRAMS' 18TH BIENNIAL POLLUTION PREVENTION HANDS-ON TRAINING TECHNOLOGY WORKSHOP SUMMARY THE WHEELS OF CHANGE - DETROIT, MICHIGAN - MAY 1-3, 2001

## 18<sup>th</sup> DP workshop: The 'Wheels of Change' grind exceedingly fine in Detroit

The U.S. Department of Energy (DOE) Defense Programs' 18<sup>th</sup> Biannual Pollution Prevention Hands-On Training Technology Workshop rolled into the Motor City on May Day.

Why a DOE workshop in Detroit? After all, automobile manufacturers and their suppliers aren't reinventing the wheel. But they ARE reinventing the processes for making our "wheels," especially when it comes to environmental stewardship. "When I go back (to a DOE facility)," one workshop attendee was overheard to say upon returning from visits to two Detroit area industries, "I'm not going to hear any more 'We can't do this, we can't do that.' I'm going to tell them the Big Three (automakers) are doing it *now*, so we *can* do it. We have to."

Such advocacy for the environment and adamancy for immediate action were stage front at the 18<sup>th</sup> Biannual Workshop. The plenary session opened with a video presentation of the multi-image show *No Higher Priority*, produced by Mac McDougald of MER, Inc. for DOE's Office of Defense Programs. The somber 12-minute tape on the severity of environmental degradation was last year's first place award winner in the Gold Screen competition sponsored by the National Association of Government Communicators. Workshop organizer John Marchetti greeted attendees and introduced Cam Metcalf, Executive Director of the Kentucky Pollution Prevention Center.

With his inimitable oratorical flair, Metcalf emphasized the reasons why the environmental management system (EMS) is the peak of the environmental management pyramid. "Before," he said, "we did pollution prevention with opportunity assessments and plans. What we found out is that today, we HAVE to have a system, people, OR THIS STUFF DOESN'T WORK!"



*Speaker/Session Leader Cam Metcalf*

... We're change agents, we're information givers, we're solution givers. We're facilitators—what we used to call pollution prevention 'champions.'" Metcalf, who jokingly apologized for his part in framing guidelines for EPA in 1974 which eventually became the RCRA regulations, challenged the gathering, "There's visionaries, there's doers, and there's finishers. It's the FINISHERS I'm after."

Marchetti spoke about Henry Ford's vision in recreating the workshops and homes of the world's top innovators in the arts and sciences in nearby

Greenfield Village museum, and how this workshop "had brought the best together like that." Taking this cue, Kelie Caudell and Valerie Haan of the State of Michigan's Department of Environmental Quality (DEQ) then shared with the workshop some of the best of Michigan industry's environmental successes. Michigan's DEQ program sets an excellent example, and according to Caudell, welcomes inquiries from out of state.

Caudell noted that more and more Michigan organizations are 'going green,' primarily by adapting an EMS, for three reasons: to gain a competitive edge, because they have to, and because it's the right thing to do. All this "makes my job easier," she said, pointing out that "implementing an EMS is guaranteed to be welcomed by government regulators. . . . DEQ used to be the bad guy, but now companies are calling us, saying, 'I filed a report late, here's my fine.'"

Haan then detailed how the Michigan Clean Corporate Citizens (C3) program has been a force in helping Michigan industries become environmental leaders. Voluntary participants in DEQ's C3 program—currently there are 39—usually go "beyond compliance," and she used case studies of C3 industries as examples. The 10 basic elements of a C3 EMS are based on ISO 14001, with a few differences. Haan emphasized that the main benefit of participating in C3 is the positive recognition of an organization's environmental performance. "You can operate responsibly and ethically every day, and no one knows it," Haan said, "but spill one drum and the media is all over it," a sentiment which resounded loudly with her DOE audience.

Tom Leonard, executive director of the Western Michigan Environmental Action Council (WMEAC), briefed the workshop on his advocacy group's partnership with business, the West Michigan Sustainable Business Forum. The Forum is made up of 65 private and public organizations from the region dedicated to defining and achieving sustainability in their operations and interactions with each other, to "overcome the conflict" between environmental concerns and commerce, as Leonard put it. "Before you criticize someone, walk a mile in their shoes," he deadpanned. "Then when you DO criticize them, you're a mile away, and you have their shoes." Seriously, he added, "Business must take the leadership in sustainability and environmental protection . . . without business leadership, we will not do well at all."

Bill Stough, WMEAC's vice-president and principal liaison with the Forum, noted that, traditionally, many businesses in Western Michigan are small or medium-sized and are family-owned. He predicted that within the next two years, all of the Forum members would have a sustainability policy. Already the Forum's success has led to the establishment of similar partnerships in Southeast Michigan and the Saginaw Bay region.

Dr. Rebecca Spearot, local host Lear Corporation's director of



environmental management, centered her presentation on the difference between “continual” and “continuous” improvement in enhancing an EMS to achieve improvements in overall environmental performance. A major manufacturer of parts for the automotive industry, Lear has over 300 facilities worldwide. Spearot’s first official recommendation to the corporation was to spend \$25,000 per facility to implement ISO 14001 standards. “I almost got fired,” she said. “I don’t know what I would do (to push certification) if Ford, General Motors, and DaimlerChrysler hadn’t published ISO 14001 guidelines” for their suppliers. The Big Three automakers’ endorsement of EMS has rippled outward throughout the supply chain, heavily influencing Detroit-area industry, including Lear, to “go green.”



Lear Corp.'s Dr. Rebecca Spearot

The afternoon session began with Lear Corporation’s EMS training film, *A Cleaner Tomorrow*. Metcalf returned to hammer on performance-based EMSs as the way to “customer delight” (beyond mere satisfaction). He pointed out that most organizations already have many components of an EMS in place. “Just go ahead and make it an EMS,” he told the workshop. “It’s there!” Internal and external (third-party) audits identify environmental aspects and impacts, about three internal audits to each outside audit. Metcalf believes that the initial internal review (“gap analysis”) yields on average about 45-75 percent of aspects and impacts. Once environmental management programs are in place which target the significant environmental aspects and impacts, he said, “ES&H can’t just sit back and fill out reports.” How employees respond to auditors’ questions is crucial to demonstrating that the EMS has become integrated into an organization’s activities, products, and services.

He related the history of EPA’s changing statement of position on EMS, from “not granting regulatory relief based on EMS or ISO 14001 registration” (1997) to training their employees in ISO 14001 as a basis for leadership programs (2000). Metcalf spoke at length of several organizations that had greatly benefited at the bottom line after integrating an EMS into their operations, as well as “doing the right thing” environmentally. He also pointed out some of the limitations of the ISO 14001 standard as well as organizational barriers to EMS implementation.

Anne Geisler of TAG Environmental Services, Inc. led the workshop in a discussion of developing an EMS in a DOE organization within the framework provided by an existing integrated safety management system (ISMS). Geisler polled participants on how many had actually read the ISO 14001 standard (a few) and how many must incorporate ISO 14001 into the ISMS at their facilities (about half the audience). She outlined the drivers within DOE for the increased emphasis on EMS and where ISM and ISO 14001 mesh and where they clash. The gap analysis process in an EMS implementation provides a good starting point for testing an existing ISMS for conformance with ISO 14001 standards, she said. She emphasized above all else the management commitment to EMS—“first things first.” When the gap analysis identified “significant environmental aspects” in a U.S. Army organization with which she

was working, all “number one” priorities were funded. A ‘facelift’ of the ISMS may be needed to fully integrate EMS criteria,” Geisler told participants.

To introduce the DOE champions to gap analysis, Metcalf led the workshop in three internal auditing exercises. Introducing participants to EMS document format, he stressed that to make the resulting documentation useful, each EMS document should include “Who? What? When? Where? Why? and How?” After discussing keys to making an audit a positive experience, he handed out sample audit checklists.

In the first exercise, participants were challenged with what questions they would ask if, during an internal audit, they encountered a leaky container of a strong-smelling chemical seeping down a floor drain, with employees unsure what to do about it. For the second exercise, the topic area groups were asked to develop an auditor’s checklist for determining ISO 14001 conformance for either a shipping procedure, an engineering procedure, or a human resource procedure. The third exercise involved pairs of participants going through an employee interview, with participants alternately taking the role of auditor and employee. Metcalf collated the results of these interviews for inclusion in the workshop proceedings (see article, p. 11).

To close the workshop’s first day, the topic area groups prepared for their visits to Detroit area industry hosts. The site visits took up the entire second day of the workshop, and the groups worked long into the night and/or rose early the next morning to prepare presentations of their observations during these visits. When participants reconvened to make their presentations at the closing plenary session on the third day, workshop organizer Marchetti exhorted them to be “finishers” in their DOE organizations. “Write down the goods and the bads in your organization, and go visit somebody in management. Don’t be afraid to be a nuisance to anybody,” he told the audience, and quoted Theodore Roosevelt:

*The credit belongs to those who are actually in the arena, who strive valiantly; who know the great enthusiasms, the great devotions, and spend themselves in a worthy cause; who, at the best, know the triumph of high achievement; and who, at the worst, if they fail, fail while daring greatly, so that their place shall never be with those cold and timid souls who know neither victory nor defeat.*

Metcalf, who led the Employee Awareness topic group, reported the results of employee interviews in a simulated EMS audit at March Coatings, an industrial parts-coating facility. Group members gave their overall impression of March’s EMS derived from their one-on-one encounters with March employees. Mac McDougald, scribe for the Continual Environmental Improvement group, presented a roundup of his group’s visits to Lear Corporation and DaimlerChrysler’s Warren truck assembly plant. Sue Morss reported on the EMS group’s visit to the Fermi 2 nuclear power facility. The Sustainable Development group reported on their visit to General Motors’ Orion assembly plant, then outdid themselves performing a dramatization of architect Bill McDonough’s involvement with Ford Motor Company’s Chairman of the Board William Ford in “greening” the company’s Rouge River Complex. Marchetti left the departing participants with this thought:

*Let no one imagine that they have no influence. Whoever they may be, and wherever they may be placed, a person who thinks becomes a light and a power.* —Henry George



# Sustainable Development visits Ford Rouge River, GM Orion plants

The Sustainable Development group from the Defense Programs' workshop, led by Karin King, visited Ford Motor Company's mammoth Rouge River Complex and General Motor's Orion Assembly Plant. The workshop group was interested in learning how the automobile manufacturers are implementing ideas both big and small toward making their operations more sustainable.

An example of a big idea is the planned revitalization of Ford's Rouge River Complex, designed by Henry Ford to build a car from the ground up. The plant was built in 1917 on an arm of the Rouge River, allowing Great Lakes freighters to deliver iron ore and coal directly to an onsite steel plant. Raw materials went in one side and completed tractors and cars rolled out the other. In its heyday, the Rouge facility employed 100,000 people working in 29 separate factories. Today the 1,100-acre complex is in apparent decline. Many old facilities are closed and deteriorating, there is environmental contamination remaining from past industrial practices, and only one car, the Mustang, is rolling out of the single remaining assembly plant.

To revitalize and rebuild an old industrial facility as large as Rouge requires an equally large vision, one held by Ford Motor Company's Chairman William Clay "Bill" Ford Jr. The Ford Motor Company committed to rebuilding the plant in 1997, but it was not until Bill Ford, great-grandson of Rouge's founder, came on board as Chairman in 1999 that the vision for the plant went from a simple modernization to being a model for sustainable manufacturing.

Bill Ford's vision for Rouge includes both lean manufacturing and environmental sensitivity, based upon the three tenets of sustainability: people, planet, and profit. In the short term it may have been much easier to replace Rouge with a brand new plant at a distant greenfield site. But the new Chairman did not want to simply remediate Rouge to minimal brownfield standards and move the manufacturing jobs to a new location. People depend on their jobs at Rouge, the Company has impacted the ecosystem along the Rouge River, and the automaker has significant history there. Bill Ford made the decision to remain part of the community his company helped create—preserve jobs, restore the ecosystem, and honor company history.

Some highlights of the 20-year, \$2 billion Rouge River revitalization project include the world's largest living roof; replacement of stormwater drains and pipes with swales containing native plants and porous pavement; phytoremediation of the polycyclic aromatic hydrocarbon contamination which resulted from the years of onsite coking operations; "greenscreens," trellises of flowering vines to provide summer shade and cooling; onsite renewable energy which could include solar panels, wind generation, and fuel cells; and the planting of over 1,500 trees and other native plants.

In addition to environmental concerns, Ford is paying attention to the social aspects of sustainability. The Rouge revitalization will restore and preserve several architecturally significant structures, including the original Dearborn Glass Plant, designed by famed Detroit architect

Albert Kahn, and the plant's landmark coke gas storage tank. The Company will also document the story of Rouge through the oral histories of families who have worked there, some for five generations.

In this grand vision, Ford Motor Company is not ignoring its fiscal obligations to company stockholders. Modernizing the Complex will make it one of the most efficient and lean manufacturing facilities in the world. The Company realizes that implementing some of the project's cutting-edge ideas will be more costly when evaluated in the short term. But Ford also is aware of the long-term cost savings associated with dependable and renewable onsite energy generation, people-friendly work spaces, and reduced environmental management costs. As summed up by the Chairman himself, "This is not environmental philanthropy; it is sound business, which for the first time, balances the business needs of auto manufacturing with ecological and social concerns in the



*Concept photo of Ford Rouge River Complex*

redesign of a brownfield site."

The workshop group saw some of Ford's lean manufacturing in practice when they toured the Rouge site's brand new paint plant, where every new Ford Mustang produced receives a colorful coating prior to heading to the showroom floor. The paint plant employs several product management and application techniques that result in minimal product waste, overspray, and hazardous waste generation. All the coatings applied to the Mustangs except for the final clear coat are water-based, which results in reduced solvent emissions and waste and fewer health and safety concerns.

The Sustainable Development group also visited the General Motors Orion Assembly Plant, where GM is implementing sustainability into the operations of an existing plant. Although the 459-acre site is not as large as the Ford Rouge River facility, the single manufacturing building—at nearly 4 million square feet—is impressively huge.

The Orion Assembly Plant's 4,100 workers produce four models of GM cars at the rate of one new car every 48 seconds. Such a production rate requires an enormous quantity of materials and energy flowing in and out of the plant. In order to cut costs and waste, GM implemented the WE CARE (Waste Elimination Cost Avoidance Rewards Everyone) program in 1990, and added chemical and resource management initiatives in the mid- to late 1990s.

By switching to a single chemical vendor and a single waste management vendor and paying both at a fixed rate, Orion was able to save money and reduce chemical inventory and waste. The fixed-rate structure motivates vendors to reduce the supply of chemicals to only that which is critical to the plant's mission. The previous unit-rate payment structure rewarded the chemical vendors and waste vendors when Orion purchased large amounts of chemicals or produced large volumes of waste.

In addition to the chemical and waste management initiatives, Orion has established a customer service model whereby the power plant and other support operations are set up as separate business units serving the manufacturing customer. This arrangement provides these support services with the incentive and authority to make their operations and services as environmentally protective



and energy efficient as possible. It also provides the manufacturing unit customer with the motivation and authority to be as energy efficient as possible in its operations in order to keep costs down and profits up.

One element of sustainability witnessed by the workshop group at Orion was in the power plant operations, where landfill gas is used for much of the steam generation. Orion is located between and very close to two municipal landfills. Orion promised to buy landfill gas from a third-party developer for 20 years if the developer made the investments necessary to collect and pipe the methane to the Orion power plant.

Orion now burns little or no coal to generate plant power during the warmer months of the year, and annual coal consumption has dropped from 56,000 tons to around 20,000 tons per year. The fly ash from coal burning is recycled into potting soil at a nearby Scotts facility.

Several initiatives at the Orion plant focus on reducing "non-product output:" all plant output costs money, but the only

thing that brings in money is product. Work practices have been put in place that reduce the mutilation and marring of the product (autos and auto components), eliminating their disposal or rework. An initiative to reduce, reuse, and recycle the scores of different plastic caps, plugs, and protectors that enter the plant attached to auto components is well underway, with 88,000 pounds collected last year. In addition, the Orion plant is working with its designers and vendors to make these caps, plugs, and protectors from a reduced variety of recyclable resins and to design them as reusable.

Looking to the future, the GM Orion Assembly Plant is making headway on the issues of waste reduction, energy conservation, and resource management through implementation of an ISO 14001 environmental management system.

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## Workshop group explores employee awareness at March Coatings

Cam Metcalf led the Employee Awareness group from the 18<sup>th</sup> Biannual Defense Programs' workshop in a site visit of one of two plants owned and operated by March Coatings, Inc. in Brighton, Mich. March specializes in applying industrial paint coatings to steel, stainless steel, cast, galvanized, magnesium, and other metal surfaces. In 1998, March became the first metal finisher in the United States to be certified under the ISO 14001 standard.

The Brighton shop visited by the workshop group has about 80 employees working in two shifts. The site visit began with a briefing session with CEO Steve March, Pres. Bruce LaValley, and Mark Tomasik, March Coatings' Director of Environment, Health and Safety and Quality Assurance. March, who took over ownership from his father in 1997, told the visitors, "We want to be a good community partner." March looks at ISO/QS 9000 quality and ISO 14001 certification as two sides of the same coin.

"We're a small operation, trying to set ourselves different," March said. "It was kind of disappointing in the beginning, (the customers) didn't care. But now (when certification does matter), people are surprised to find we've had our systems in place for years. We wanted to show that metal finishing was not a low-tech, 'dirty' industry."

Continual improvement, a major component of both certification standards, has certainly paid off for March in terms of pollution prevention. Among many other successes, the coatings shop produces only two hazardous waste streams: a few discarded fluorescent lamps and spent spray cans of water-based touch-up paint; the spray cans are being phased out in favor of paint markers. Leftover "peel," a non-hazardous masking material, is used in a local fuel-blending operation, but is being replaced by precision painting machinery. About 20 cubic yards of non-hazardous sludge from the coating tanks is landfilled every four months.

March Coatings was the first metal finisher to receive the Clean Corporate Citizen designation from the Michigan Department of Environmental Quality (DEQ). Because of the company's record with DEQ, Tomasik said, "We wanted a little competitive edge when it comes to permitting, and they came through" on a recent application.

Tomasik told the workshop group that EMS training has been the biggest challenge. "You've got to involve the workers. If they're involved, they'll buy into it." Besides basic EMS indoctrination for both its English- and Spanish-speaking employees, March Coatings uses positive incentives to encourage its employees to work environmentally smart. For example, bilingual quizzes and puzzles relating to the EMS are included in weekly paycheck envelopes, and employees are awarded premiums for completing them successfully.

But the most effective incentive to employee involvement is the coatings company's "gainsharing" program. When employees help save money for the corporation by following quality and EMS standards to meet scheduled production and pollution prevention goals, they receive half the earnings. Over a 10-month period in 2000, gainsharing payments to the employees at the two Brighton plants totaled over \$58,000.

The workshop group moved onto the plant floor to interview employees in a simulated EMS audit and discover how well March Coatings' incentive program works. Tomasik introduced group members to a coating line leader, a lab technician, a supervisor, a line loader/unloader, a maintenance craftsman, and a worker from shipping & receiving. Group members asked the randomly selected March employees questions provided in the previous day's workshop session which are designed to reveal the extent of a worker's awareness of the company's environmental policy and how it extends into his or her daily activities.

"They walk the talk," one group member reported to the workshop assembly the following day. "They know their policy, and they know and share the benefits when the policy is met." Said another interviewer, "The employees with whom I spoke had at least a basic understanding of the need for environmental responsibility in their jobs and how to achieve it. This understanding is definitely management driven—Mark (Tomasik) has a bullwhip on his wall!"

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## DOE visitors observe continual environmental improvement

As the world's fifth-largest automotive component supplier, with 335 facilities and 121,000 employees worldwide, the challenges that face the Lear Corporation epitomize the pollution prevention (P2) complexities faced within that industry. Environmental Management Director Rebecca Spearot and Facilities Engineering Manager Scott Dougherty recently hosted the Continual Environmental Improvement group of the Defense Programs' workshop at both the Lear World Headquarters in Southfield, Mich., and the company's Rochester Hills plant, where seat assemblies for the General Motors' Sierra and Silverado truck series are manufactured. The workshop group's visit reiterated both successes and impediments to P2 at the component supplier.

Lear's strategies for continual P2 improvement fall into two major areas:

- **Energy consumption reduction:** Aggressive conservation policies relating to electrical and HVAC usage are encouraged and regulated where possible via occupancy sensors and automatic controls. T8 and other high efficiency lighting is deployed and energy costs are reduced with fixed contracts for natural gas and active participation in deregulated energy markets. A rigid preventative maintenance program ensures that energy consumption for equipment such as compressed air devices is optimized.
- **ISO 14001 certification:** A major driver for this initiative is that all Lear's major customers are going to require that direct supplier plants achieve ISO 14001.

For example:

- DaimlerChrysler requires suppliers to be third party registered to an environmental management system based on ISO 14001 effective January 1, 2003.
- Ford requires all suppliers with manufacturing facilities to certify one facility to ISO 14001 by Dec 31, 2001 and all by July 1, 2003. Ford also published their Q1 2001 requirements February 28, 2001, which now include ISO 14001 certification requirements.
- GM requires all direct product suppliers to have an environmental management system in place for all manufacturing facilities involved in supplying General Motors by December 31, 2002. Companies must demonstrate compliance with GM's policy to be included in bid lists after December 31, 2002. Over 60 Lear facilities have already accomplished the process and are serving as mentors to the others.

Other P2 innovations at Lear facilities include:

- Availability of bins for employees' home recyclables, including batteries, at the Corporate Headquarters.
- Use of recycled materials, such as "shoddy" in auto interior linings ("shoddy" is a padded material made from recycled denim, rags, etc.). Also, Lear Corporation recently received the Auto Interiors 2001 Design & Technology Award for SonoTec EP™, which contains up to 65 percent post-industrial carpet and is currently being used as a dashboard insulator by General Motors.

- Three million pounds of used nylon carpeting

reused as conduit tubing for wiring harness.

- Using water-based release agents, replacing solvent-based release agents in urethane foam molding operations.
- Implementation of a North American contract with Heritage Environmental Services to reduce waste disposal costs and increase recycling at the manufacturing level.
- Other Lear programs, such as Six Sigma, which also have resulted in many P2 projects.

Spearot and Dougherty also expounded on the impediments faced in attempting quantum leaps in P2 innovation; their topic summary serves as a technological "to-do list" for the automotive component manufacturing field in general.

- Several of Lear's plants operate on a strict Just-In-Time (JIT) guideline, both for material intake and product output. The Rochester Hills plant, for example, relying upon a direct computer link with GM, produces seating assemblies within two and three-quarter hours of request. While JIT operations reduce both inventories of raw materials and produced goods, it limits many structure-related energy investments since (1) buildings must often be significantly revamped to accommodate changing product lines and specs and (2) approximately 60 percent of U.S. facilities are leased, precluding long-term financial outlay for building energy enhancements.
- The sheer manufacturing diversity and changing specifications (hundreds of components falling into six major product lines: instrument panels, flooring and acoustics, headliners, door panels, seating, and electronic & electrical) often put production technology and P2 implementations at loggerheads. For example, much specialized machinery is driven by compressed air, an expensive and complicated energy to produce; an effort to procure AC motor driven devices is ongoing, but this is simply not an option in most cases. Recycling and reuse of materials is hampered by product specifications calling for bonding of dissimilar materials (often with the addition of electrical wiring molded into the component layers) to decrease weight. While this ultimately saves fuel consumption in the finished vehicle, it prevents simple disassembly of the components both in rejected product at the manufacturing level and during end-of-life reclamation of the vehicle itself.
- Perhaps the most limiting factors in many P2 decisions are "bottom line" considerations. The auto component manufacturing industry operates on an extremely low profit margin. Management mandates that any outlay for energy-saving techniques have a maximum 12-month payback. (Again, this reflects the fact that many owned buildings must undergo periodic major revamps and leased buildings may not be utilized long enough to realize the savings.) Also, economics of on-site and off-site materials separation for recycling/reuse are not favorable due to high labor costs.

Spearot feels that as Lear's facilities travel the road to ISO 14001, it is likely that other achievable P2 goals and incentives will emerge—and that is another fine reason for the journey.

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## Two groups visit DaimlerChrysler Corporation

# Venerable Warren Plant the place to look for P2 innovations

The Warren (Mich.) Truck Assembly Plant is one of DaimlerChrysler's oldest; its production lines have been redesigned numerous times since it was built in 1938. Nearly 3 million square feet including 12 miles of conveyors and 350 robotic devices, sitting on 86.8 acres, and employing over 3,800 workers in two shifts, the Warren complex assembles Dodge Ram and Dakota trucks from stem to stern.

Members of the Continual Environmental Improvement and Employee Awareness groups from the 18<sup>th</sup> Biannual Defense Programs' Workshop toured the Warren Plant in May. Plant Manager Fred Martino-DiCicco and Plant Engineering Manager Gordon Waller greeted the Department of Energy (DOE) visitors. "Pollution prevention and environmental concerns (at DaimlerChrysler) have come to a pitch that I haven't seen in my 28 years," Martino-DiCicco told the visitors. "Sometimes it's a pain," he quipped, "but it's the right thing to do."

DaimlerChrysler's Doug Orf, Senior Specialist in Recycling and ISO Requirements, said, "When we're looking for new pollution prevention ideas for our assembly lines, we come to the Warren Plant." Orf and plant environmental compliance specialists Brian Miller and Sandi Lopez, who guided the workshop groups on an exciting motorized tour of the huge plant, reviewed Warren's environmental record for the workshop groups.

Warren was recently re-certified for ISO 9002; that process and a comprehensive "enhanced" environmental management system (EEMS) are instrumental in the plant's goal to be ISO 14001 certified as soon as possible. The DOE visitors noted the EEMS slogan "PIC," posted conspicuously throughout the plant: "Preventing pollution, Improving continuously, Complying with all environmental requirements." Warren has made steady progress in pollution prevention over the past decade: hazardous waste produced per vehicle (mostly solvents for paints) was reduced from 14.07 pounds in 1990 to 4.72 pounds in 2000. Non-hazardous waste per vehicle went from 121.18 pounds in 1994 to 64.03 pounds in 2000.

Other indicators of the PIC attitude include a trained emergency response team, monetary rewards to employees for applicable environmental suggestions, and compliant treatment of a half-million gallons of water daily, a mammoth operation which the DOE visitors witnessed firsthand during their tour. Some specific environmental successes that have reduced waste and saved money are the result of management, employees, or vendors "thinking outside the box," Miller told the visitors. These include:

**Powder Anti-Chip.** Previously, a thick anti-chip agent, high in VOCs, was applied to lower surfaces of the truck body, impacting air emissions standards and producing hazardous waste. An improved, powdered agent is now applied over the entire body of the truck. Not only does the compound contain negligible VOC content, but the small amount of wasted product is sold offsite for use as plastic molding filler. Although more floor space was needed to implement the process, the savings for hazardous waste treatment and air emissions control has been significant and the entire truck surface is now protected.

**Returnable Containers.** Parts from vendors were traditionally received at the plant on wooden pallets, packed in cardboard. A wide array of reusable containers, custom-made for each vendor's parts, were designed and purchased. While the logistics of revolving the containers between vendors and the Warren plant was complicated, it has eliminated the vendor cost for packing material while abolishing most of the cardboard waste and pallet handling at the plant and, of course, reducing the burden on natural resources.

**Urethane Reduction.** Urethane, applied to adhere windshields onto truck bodies by robot required a backup robot to be primed at all times; its pumping system design necessitated applicator tip purging every five minutes. Simple application of petroleum grease to the tip eliminated this need. Fifty cents and creative thinking resulted in material savings, elimination of a waste stream, and \$100,000 savings annually.

**Purge Solvent Reduction.** Paint color changer valves were 23 feet from the robot arms. Moving the changer valves onto the robot arms themselves requires that only eight feet of hose to be solvent-purged between color changing. Results: 70 percent less paint and solvent used during changes. The retooling outlay of \$250,000 sees an annual cost avoidance of double that in material savings and reductions in hazardous treatment costs.

**Paint Powder to Sealer Parts.** Wet paint sludge remains from paint overspray. An improved dryer now transforms this sludge into a powder that is reused in sealer patches for truck floor pans. The process not only creates an in-plant reusable product from hazardous waste but also has significantly reduced VOC emissions.

**Used Polypropylene Rag Recycling.** Rags pre-soaked with isopropyl alcohol, used in great quantities in the paint shop, required extensive hazardous waste treatment. An outside vendor now centrifuges the rags to separate the alcohol and paint residue, which is used offsite in fuels blending. The now non-hazardous rags are laundered, densified, and ground into almost pure polypropylene for reuse in vehicle parts.

During their tour, the workshop visitors were invited for a close look inside the mobile centrifuge unit where the alcohol and paint residues are removed. The truck-mounted rag-recycling operation, the brainchild of vendor Dave Briggs, is scheduled to make regular rounds of other DaimlerChrysler plants to reclaim their polypropylene wipes.

These real-world examples from DaimlerChrysler reminded the DOE groups that pollution prevention innovation is not only "the right thing to do," it can also be a money-saver—if not immediately, then almost always over time. A real value of the ISO 14001 process for Warren is that the plant's comprehensive EEMS will pinpoint further areas for environmental improvement.

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DaimlerChrysler Corporation Warren Truck Assembly Plant



## Environmental management system working well at Fermi 2

“Management commitment and involvement . . . Open communication . . . Commitment to continuous awareness and improvement . . . Employees, at all levels, aware and involved . . . Integrated into procedures and work practices . . .” These were the comments and observations made by the Environmental Management System (EMS) working group after their site visit to Detroit Edison’s Fermi 2 Nuclear Power Plant, located in Newport, Michigan. As part of the Defense Programs’ 18<sup>th</sup> Biannual Pollution Prevention Technology Workshop, the Environmental Management Systems (EMS) working group was treated to the comprehensive site visit and the opportunity to see, first hand, the nuclear power plant’s EMS at work. An EMS is a voluntary, systems approach to identifying, controlling, and monitoring activities that may impact the environment.

The Fermi 2 Nuclear Power Plant, a 1,139-Megawatt reactor that began operations in 1988, is located on 1,100 acres on the shores of Lake Erie in southeastern Michigan. It employs an estimated 1,000 people, and—although the group didn’t talk to all 1,000—each employee’s involvement, pride and commitment to Fermi 2’s environmental program was obvious.

Michael Trapp, Information Center Coordinator, and Lynda Craine, General Supervisor, Environmental Health, directed the day-long tour and related the many features of the plant’s environmental management program (EMP) and how it is integrated into the day-to-day operations and work practices.

In 2001, Fermi 2 became the first nuclear station to receive the Clean Corporate Citizen (CCC) designation from the Michigan Department of Environmental Quality. The CCC designation recognizes Fermi’s in-place and effective EMS and their record of environmental performance. Fermi 2 is also an active member of the Michigan Pollution Prevention Partnership and a portion of their 1,100-acre site is designated as a Wildlife Habitat with ongoing restoration programs and partnerships with Ducks Unlimited, Pheasants Forever, and local community groups.

Bill O’Conner, Vice President of Nuclear Generation, told the EMS working group that his role as senior management was to “set the vision and get out of the way.” O’Conner kicked-off Fermi 2’s effort for the CCC designation after reading about a neighboring facility that was already in the program. Recognizing that “our environmental program was as good if not better than theirs,” the VP sent a note to Lynda Craine and set the wheels in motion to obtain the CCC designation. The Vice President’s support for the EMP was also evident by his involvement in tying environmental performance to employee bonus programs; leading efforts to transfer the cost for waste disposal from the environmental group to the generating organization; supporting the hiring of additional qualified staff for the environmental group;

and supporting ISO 14001 certification for the plant.

Fermi 2’s EMS is embodied in management and policy statements that are posted around the plant as well as work packages, operating procedures, site orientation training, and employee performance appraisals and incentive programs. Fermi 2’s in-place programs and procedures “ensure that consideration and respect for environment is integrated into all activities, plant operations, and the overall management structure” (Fermi CCC application). Regarding the progression of the EMS, both O’Conner and Craine noted the CCC application helped Fermi 2 to document their EMS but “most of it was already there” and it was just a matter of pulling it together. Further, they noted that their EMS was positioning them for ISO 14001 certification, which they hope to have in place by the end of this year.

The Fermi 2 EMS identifies environmental aspects and impacts, including resource inputs (nuclear fuel, non-

nuclear fuel, water, chemicals, oil, packaging), production outputs (air emissions, non-radioactive water discharges, solid waste, hazardous and radioactive waste), and disposition pathways. Operating reports include environmental performance measures for NPDES and stormwater discharges, spills, unusual environmental events, generation of hazardous and mixed low-level radioactive waste, and air emissions. The generation and reduction of low-level radioactive waste is also tracked as a plant efficiency performance measure. The facility currently operates with no radioactive liquid waste discharges, a goal of zero generation of mixed low-level radioactive waste, and high attention to “foreign material exclusion” in radiation control areas, thus minimizing the generation of low-level waste. “Everyone in this plant pays attention to foreign material exclusion because they understand the financial implications that it can have,” said Greg Colvin-Garcia, a radiation protection technician who assisted with the tour.

During the tour, the group saw the Fermi 2 generator, reactor, control room, waste storage areas, waste processing areas, cooling towers, fuel storage pools, and the surrounding habitat and wetlands areas. In each location, the group had the opportunity to talk with employees and supervisors and noted that awareness and responsibilities for the EMP was present at every level. Employees were aware and proud of the plant’s EMP and the CCC designation.

The EMS working group concluded that the Fermi 2 EMS is effective in achieving not only operational control and compliance, but also top-to-bottom pride and commitment to environmental program improvements. The CCC flag, a symbol of the EMS in place, is prominently flown at the entrance to the plant and as several workers noted, “It keeps us focused on the importance of environmental issues . . . nobody wants to lose that flag.”



*Fermi 2 was the first nuclear station designated a Clean Corporate Citizen by the Michigan Department of Environmental Quality, based on the plant's effective EMS.*



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## Interview answers reveal DOE environmental successes, challenges

Kentucky Pollution Prevention Center's Executive Director Cam Metcalf doggedly pursues what appears to be an ideal for him—educating the right people the right way for the right job.

Knowing that many of the attendees of the Defense Programs' 18<sup>th</sup> Biannual Workshop are being encouraged to implement environmental management systems (EMSs), Metcalf designed an exercise that would allow participants to focus on one aspect of an EMS, the audit. As part of the exercise, workshop participants paired off and interviewed each other from a prescribed list of questions, recording the answers.

The questions were similar to those used in the employee interview of an actual internal or third-party EMS audit: What is your company's environmental policy?

What are the significant impacts in your work area? Do you know where the procedures are? Two questions were more subjective: Can you provide examples of something that has improved environmentally over the last couple of years? What would you like to see improve environmentally in the future? The pattern that emerged from an initial review of the 30-40 participants' responses to these last two questions calls for an analysis.

Their responses to the first of the two subjective questions indicate that the Department of Energy (DOE) and DOE contractor employees who participated in the interview feel that in general there *is* improvement in reducing waste and emissions in their organizations. Although most interviewees didn't specify how these reductions were being achieved, many implied that the improvements resulted from process modification, both technical and programmatic. For example, regular process analysis associated with high explosives area testing at one DOE site resulted in simplifying the process, reducing waste per product unit from 1299 kg to 3.7 kg. A preventive maintenance program at another facility effectively reduced the environmental impact of maintenance activities. Procedural removal of all non-latex paints at another plant eliminated a hazardous waste stream.

A number of improvements listed in response to this question resulted from willingness and creativity, not necessarily large sums of money. Beyond a specific cluster of like answers detailing recycling activities, projects cited as environmental improvements were singular and specific in nature. A few of the answers focused on true technical advances that a facility had chosen—a

new solar film on windows, digital photography, technically superior methods of spill detection and prevention. One response focused on affirmative procurement, another on redesign, still another on energy efficiency, while three referred to compliance-driven improvements and one to non-specified source reduction.

By comparison, workshop participants' answers to the question addressing future environmental improvements tended to be

more all-inclusive and rather philosophical. Specific answers—finish the boiler replacement project, install a solar wall on the south side of the building, pursue development of a better ventilation system in plating shops—were far outnumbered by more encompassing suggestions: Adopt zero waste as a goal for the facility; develop an EMS to be implemented

throughout the organization; involve more employees in the process to improve all work areas that have potential environmental impacts; involve more managers; develop more and better training for everyone; systematically replace all obsolete, worn-out equipment; concentrate on smart growth; eliminate all carcinogens; use more benign chemicals; and increase energy efficiency *everywhere*.

The awareness portrayed by these answers recall a slide from Metcalf's earlier presentation to the workshop audience, depicting the "Evolution of Industry's Environmental Management." An ascending curve rises through the last 30 years in steps from non-compliance to compliance, upward through pollution prevention to EMSs, and peaks in the current century at what we call sustainability.

Near the top of this curve are steps that DOE facilities are only now beginning to use, such as environmental management accounting, preferable purchasing, product stewardship, design for environment, and life-cycle assessment. Nevertheless, DOE sights are set on that sustainable peak, and steps in that direction are a little more confident each day. What workshop attendees discovered in tours of Detroit-area industry

was that DOE is not alone; private companies are on the same slope, taking the same risks, yet reaping unexpected benefits on the way up.

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*Detroit workshop participants pay close attention to instructions for conducting an EMS audit interview. (L-R) Cynthia Zvonar, Deborah Lazowski, Ron Walton, Mike Sweitzer, Carol Laumeier*



*EMS group members discuss the audit exercise. (L-R) Suzanne Hartnett, Scott White, Lydia Edwards, Carol Panagiotides, Steven Woodbury, Sandra Stallings*



## Rocky Flats 'room fogging' reduces personnel entries, secondary waste

At Rocky Flats Environmental Technology Site (RFETS), a technology known as "room fogging" has avoided 86.19 cubic meters of waste and saved \$2,898,000 since the technique was first applied in 1999. A machine-made, airborne sugar "fog," Capture Coating™, has been used along with a fluorescent tracer, Invisible Blue™, and a poly-urea coating, Insta-Cote™, to reduce airborne contamination during the decontamination of Building 371, a plutonium packaging and storage facility. Radioactive particles in the air adhere to the fog and drop out of the air as the fog settles on the floors and walls. Under black light, the tracer shows the contaminated surfaces, and a thin layer of the poly-urea coating is applied to fix the contamination and provide a workable surface for future cleanup workers.

Fogging significantly reduces secondary waste generated during decontamination of "infinity" rooms (rooms with airborne radioactivity concentration levels that are higher than hand-held radiation detection monitors can measure). The conven-



*Bill Rigby tests a room fogging machine in Building 371, a plutonium packaging and storage facility at the Rocky Flats Environmental Technology Site.*

tional method for decontaminating infinity rooms involved erecting containment structures, removing debris, wiping, scraping, chipping, and high-pressure water spraying, which created large quantities of waste and required numerous room entries by personnel with supplied breathing air. With the fogging technique, supplied breathing air entries are limited to the time required to remove debris and set up the fogging equipment. Waste generation is limited to disposable supplied-air suits, the containment, and unused coating. According to John Wrapp, the Building 371 Facility Disposition Deactivation Manager, the biggest technical challenge was to obtain the proper airflow conditions in the room. "For optimal fog dispersal, we needed to achieve a static condition.

Occasionally several applications of fog were required as we made adjustments to the air-exhaust supply."

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## BWXT Y-12 Complex closes the pallet loop with plastic reuse

Having problems with wooden pallet pile-up at your site? Finding it hard to come up with ways to eliminate wooden pallets without adding a major cost? Sick of dealing with splinters, mildew, and rotten wood?

The BWXT Y-12 National Security Complex, in Oak Ridge, Tenn. may have a solution for you. Y-12 is pilot-testing a Plastic Pallet Closed Loop Program, which aims to eliminate the current use of wooden pallets by the Y-12 Complex's Acquisition and Asset Management division.

In the pilot test, a vendor will deliver materials on a plastic pallet provided by Y-12 and pick up an empty plastic pallet for its next delivery. Materials Management Organization (MMO) will deliver the material on the plastic pallet to its destination within the Complex. After the material is unloaded, MMO will pick up the plastic pallet and return it to the receiving point for reuse by the vendor. A bar-code system will be used to track each pallet.

It took an exhaustive search by Y-12's Pollution Prevention Program Office to find a pallet that meets current standards for both recycling and fire prevention. Metal pallets were ruled out for several reasons, including rusting, sharp edges, possible sparking, electrical conductivity, reactivity with certain chemicals, and criticality issues. The P2 office ultimately recommended a plastic pallet, the Noryl® Advantage EDGE™, which has



*Plastic pallets now in use at the BWXT Y-12 National Security Complex can last up to eight years before recycling; wooden pallets typically last through only about 10 delivery cycles.*

a useful life of eight years and is the only pallet in the shipping industry which meets the rigorous Underwriters Laboratory codes for storage.

A well-made wooden pallet usually lasts through about 10 delivery cycles; a plastic pallet can last 150 delivery cycles. Plastic pallets are not only easier to maintain and more durable than wooden pallets, but they weigh less and are self-extinguishing and insect-proof. Most importantly, plastic pallets can be returned for recycling at the end of their useful lives.

Y-12 has implemented a "banking" system for its existing wooden pallets, which are still used for transporting some wastes. Employees requiring a wooden pallet can now contact the Y-12 Pallet Bank, which stockpiles and recirculates existing pallets, eliminating the procurement of new ones.

More than 600 million new wooden pallets are manufactured each year in North America, a \$5 billion industry that not only depletes valuable forest resources but also generates enormous volumes of landfill waste. As many as 2 billion wooden pallets are in circulation throughout North America, about 2,000 of those at the Y-12 Complex.

Contact Eva Irwin, Y-12 Pollution Prevention Program Office, 865-241-2581 or [exi@y12.doe.gov](mailto:exi@y12.doe.gov)

## D&D project yields savings

More than 11,355 metric tons of scrap metal, equipment, and materials have been recycled as part of an ongoing decontamination and decommissioning (D&D) and recycling project being carried out by British Nuclear Fuels Limited Inc. (BNFL) at the shut-down gaseous diffusion facilities in Oak Ridge, Tenn.

The recycling has earned the U.S. Department of Energy (DOE) \$26 million in contract cost reductions, including \$5.2 million in avoided waste management costs. The \$238 million fixed-



*The 34-acre cell floor of the K-33 building holds 13-foot diameter gaseous diffusion vessels. The contractor, BNFL, is removing the process equipment and will decontaminate the building for lease to a private-sector user. BNFL has given a \$55 million contract credit for the revenues from the recycle of the equipment and material.*

price contract, to empty and decontaminate three buildings (K-29, K-31, K-33) at the DOE East Tennessee Technology Park (ETTP) was awarded in 1997. The buildings were filled with uranium-contaminated equipment requiring security, environmental, and safety precautions. BNFL credited the contract \$55 million for the recycle of materials from the buildings. The structures are slated for lease to private-sector users.

"The BNFL contract, with a credit for recycle of equipment and scrap materials marked a new approach to the disposition of surplus DOE facilities," said Vince Adams, a director with the DOE's National Center of Excellence for Metals Recycle. "The approach has reduced the overall D&D cost, accelerated the completion of the D&D, and will make the surplus facility available for reuse by commercial business."

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## LTTD reduces mixed low-level waste soil disposal at ETTP

Toxicity of contaminated soil has been reduced at an Oak Ridge site thanks to the use of a technology called Low Temperature Thermal Desorption (LTTD).

URS Radian, a Bechtel Jacobs Company subcontractor, began using LTTD in February to treat approximately 250 cubic yards of contaminated soil at the East Tennessee Technology Park (ETTP). The soil had been excavated from an organic solvent disposal pit, known as G-Pit, located inside the K-1070 C/D Burial Ground. Three disposal trenches are known to have existed at K-1070 D Area. Low-level radioactive materials and nonradioactive, nonhazardous waste materials and equipment were buried in three trenches (A-C) from 1976 to 1989, when the last trench

## Technology sharing prevents waste

Adoption by Oak Ridge of a characterization technology currently in use as part of the Fernald site environmental restoration program would result in significant cost savings and waste reductions in environmental remediation-related sampling for Oak Ridge Operations.



*The radiation scanning system (left), a rolling device fitted with a sodium iodide detector and global positioning system, provides rapid gamma scanning capability and instantaneous display of soil contamination. The tripod-mounted, portable high-purity germanium (HPGe) detector (right) performs real-time, in situ isotropic spectrometry.*

Bechtel Jacobs Company personnel are coordinating reuse of Fernald equipment in a technology deployment and demonstration for Oak Ridge Reservation (ORR) regulators. The innovative, real-time radiological characterization equipment is vehicle-mounted and is expected to reduce down time in field excavations, as well as reduce the amount of sampling-related wastes and other secondary wastes. All in all, remediation schedules and field activities will be accelerated.

Deployment of the innovative technology at 12 Fernald soil remediation areas was made possible by regulatory approval to use the technology for pre-design, "hot spot" identification, excavation support, and pre-certification. Regulatory approval of this technology for field use at ORR and subsequent reduction of number of samples required to document cleanup levels will be pursued in conjunction with this technology deployment.

Contact Paula Kirk, ETTP, 865-576-7344 or [kirkpk@oro.doe.gov](mailto:kirkpk@oro.doe.gov) and go to <http://www.bechteljacobs.com/ettp/orpublic.htm>

was filled and grassy vegetative cover established. The North and South Pits of the K-1070 C/D Burial Ground were used from 1977 to 1983 for disposal of organic chemical and glass waste.

In LTTD, the soil is heated to approximately 600 deg Fahrenheit in a low-temperature thermal desorber to reduce volatile contaminants. Following treatment, the residual soil is analyzed to ensure the contamination has been sufficiently reduced to meet criteria applicable for disposal as low-level waste (LLW) rather than as mixed low-level waste (MLLW). The total project savings over baseline was more than \$1 million.

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## Clean concrete, debris left behind in old landfill at Hanford Site

At the Hanford Site, the volume of soil excavated from the 600-23 J.A. Jones waste site was reduced by utilizing a screening plant. "Basically, the site was a landfill that had potential hazardous and radioactive contamination," said John April, Project Engineer. "Therefore, we had to segregate and monitor for both. We also pulled a substantial amount of concrete debris and were able to get EPA support to leave it behind for backfill." It was originally estimated that 10,000 tons of soil would have to be removed. Using the screening plant to segregate non-contaminated debris from soil, the total was reduced to only 3,400 tons, eliminating 2,883 cubic meters of waste and avoiding disposal costs of \$396,000.

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Contaminated soil at the 600-23 landfill on the Hanford Site undergoes a screening process, where small debris is separated from soil for use as backfill in the site closure operations.

## Sale of ORNL scrap metal means money, less radioactive waste

In a continuation of an activity begun last year, the U.S. Department of Energy's (DOE) National Center of Excellence for Metals Recycle (NMR) partnered with the Oak Ridge National Laboratory (ORNL) to sell scrap metal and equipment rather than dispose of it as suspect low-level radioactive waste.

The survey records for the material, which was accumulated prior to 1991 did not fulfill current requirements for unrestricted release, and was sold to a radioactive material licensed commercial vendor for processing for recycle.

The material was transported to the vendor's off-site licensed facility, surveyed and decontaminated (as needed) prior to

selling the materials for recycle. As of now, a cumulative total of 2,595 tons of material has been reused or recycled for a

cumulative estimated cost avoidance of \$10 million for the entire project.

"This project was an initial effort by NMR to have a commercial licensed recycle vendor process a large volume of suspect contaminated materials for recycle," said Karen Deacon, Project Manager for NMR. "This project has served as a model for similar projects at other DOE sites."



These pictures dramatically show the successful removal of metals sold out of the ORNL scrapyard. The left image shows 232 40-cubic yard pans (large containers) on the reservation prior to the recycling operation. The photo showing the vacant lot was taken last year, a few years after the commencement of the program.

Contact Christine Goddard, ORNL, 865-241-1780 or [goddardcm@oro.doe.gov](mailto:goddardcm@oro.doe.gov)

## Grouting fixes rad soil in place, saves 'dig and haul' at SRS



Contaminated soil at the Savannah River Site's K-Reactor Seepage Basin was stabilized using a crane-mounted grouting apparatus.

At the Savannah River Site (SRS), in situ stabilization of radioactively contaminated soil at the K-Reactor Seepage Basin avoided a CERCLA closure that would have required a "dig and haul strategy," with the soil disposed of as radioactive waste. Instead, with input from regulatory agencies and the public, the contamination was stabilized in place using grout pumped through a hose to a large diameter mixing head and into the soil, where the hardening grout forms an impermeable layer. A low-permeability, engineered soil cover is then constructed over the area to further reduce water infiltration. The K-Area in situ stabilization project cost only \$3,000 to implement and avoided 2,081 cubic meters of waste and \$293,050 in costs.

Contact John Harley, SRS, 805-557-6632 or [john.harley@srs.gov](mailto:john.harley@srs.gov)

For a summary of waste avoidance and cost savings for Operations/Field Offices reporting pollution prevention projects for the 1st and 2nd Quarters of FY 2001 through the EM-22 Accomplishments Data Base, go to <http://www.doep2.org/wastemin>.

# Greening the grounds at the Pacific Northwest National Laboratory

The Pacific Northwest National Laboratory (PNNL) is greening its grounds by annually avoiding use of 220 million gallons of water and 200,000 kilowatt hours of electricity to maintain an attractive and professional landscape—proving that less is more.

In FY2000, Pacific Northwest's Facility Operations Department reorganized its services to be more business- and customer-oriented. Out of the reorganization came Facility Infrastructure Services, with the mission to identify and implement strategies to manage utilities and grounds economically and environmentally.

To help meet this mission, the Grounds Group researched state-of-the-art techniques for grounds management and began testing the techniques. From the test results is evolving a long-range, comprehensive plan to rejuvenate Pacific Northwest's grounds. The goal of the plan is long-term economic and environmental sustainability, reducing irrigation water use by 50 percent over time as well as reducing energy use and improving the quality of life, health, and safety of the staff at work.

The standard operating procedure at Pacific Northwest today is to question all present practices, apply new ones that experts in the field vouch for, and experiment with others to determine what works best. This has changed nearly all of Pacific Northwest's grounds management practices. For example, Grounds Group personnel:

- Audit water use in all areas as a baseline for evaluating water reduction methods.
- Replaced flood irrigation system and flood control valves (which only watered next to the trunks of the sycamore trees) with sprinklers on automated timers. The sprinklers now deliver water to the entire root zone of the trees instead of just a narrow area. The automated timers have reduced water run-time from over 72 to around 42 hours per week, and allow Pacific Northwest to water early in the morning when water loss from evaporation is the lowest.
- Aerate, top dress, and overseed the lawns to make them more drought-resistant and lessen the amount of water and number of watering times. The top dressing contains sand, which along with aerating, will help eliminate the thatch build-up. Eliminating thatch will allow standing water to seep in and

promote deeper roots, which do not require watering as often. In one year's time, Pacific Northwest reduced the time to water

the lawn by 20 percent, with the goal of reducing it by 50 percent as root systems adapt and develop.

- Invested in more efficient and lighter-weight lawn mowers. These lawn mowers reduce mowing time by over 30 percent, conserve a like amount of fuel, and do not compact the soil as much, because they are roughly 1,000 pounds lighter than the original mowers. Mulching mowers now fertilize the lawn with cut grass, reducing the use of fertilizers and retaining moisture.
- Mow with electric mowers in court yards, which eliminates fumes, noise, and saves fuel.
- Compost leaves and yard debris to reuse as soil amendment, which saves dumpster disposal costs, reduces landfill volume, and reduces soil amendment costs.
- Test the soil and fertilize according to the test results. This has allowed

Pacific Northwest to use only those nutrients shown to be lacking in the soil.

- Replace shrubs in parking areas with bunchgrass. The bunchgrass is native to the Pacific Northwest area, so it requires much less water, is more in tune with the climate changes, and is more resistant to local diseases.
- Replaced aged and ailing oaks with Ubanite ash trees. The new ash trees are better suited to the local climate and have a long track record of good health in the area. Because the Ubanite ashes are much taller with broader foliage than the oaks, they give more shade and reduce the cooling load on adjacent buildings during hot summer months.
- Changed the process for the pond water used to cool the buildings by irrigating with it when it becomes too warm to use in the chillers.
- Included in the contract for farming part of Pacific Northwest's land a requirement to use best industry practices. The farmer is now monitoring moisture content in the soil and only watering when necessary. The farmer previously irrigated up to 24 hours a day, at a rate as high as 1,200 gallons per minute
- Purchase recycled edging, mulching products, and signage.

Contact Jeff Lettau, PNNL, 509-372-6490 or [jeff.lettau@pnl.gov](mailto:jeff.lettau@pnl.gov)

## VSoLE, ADVISOR programs steer NREL toward cooler car interiors

The U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) Center for Transportation Technologies and Systems team has developed the Vehicle Solar Load Estimator (VSoLE) program, a tool to help keep automobile users comfortable and reduce energy use. VSoLE is designed to analyze various types of window glazings with regard to vehicle cabin heating and determine how much solar energy is absorbed by

the glazings. The VSoLE program will be integrated with another program developed at NREL, the Advanced Vehicle Simulator (ADVISOR), to further examine the characteristics of window glazings, and how they impact passenger comfort and save energy.

Contact Sarah Barba, NREL, 303-275-3023 or [sarah\\_barba@nrel.gov](mailto:sarah_barba@nrel.gov)



(Clockwise from center left) Eroded tree roots from flood irrigation with manual valves ("Before"), replaced by timer valves and sprinkle irrigation ("After"); top dressing with sand; (center) less thatch, deeper roots in lawn grass; PNNL's "greener" grounds; aerating lawns.

2001 Gold Screen Award Winner

## NAGC recognizes *No Higher Priority* than environmental stewardship

In May, the Office of Defense Programs received a first-place award in the 2001 Gold Screen Competition sponsored by The National Association of Government Communicators (NAGC). The three-projector slide/sound presentation *No Higher Priority*, commissioned by John Marchetti (DP-42), was written and produced by Mac McDougald and Elizabeth McPherson of McPherson Environmental Resources, Inc. (MER). *No Higher Priority* is both an informational and emotional account of the extent of degradation of Earth's resources, designed to motivate audiences to become stewards of the environment. The twelve-minute multimedia award winner is a poignant "progress report" on how mankind fares as a species within the context of geologic time and current environmental dilemmas. It has been shown both in its original slide projector format to large audiences and on VHS videotape in smaller settings. For information on obtaining copies of the presentation contact MER at 423-543-5422 or mer@mer-inc.com.



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